

## Socio-demographic and substance use characteristics of unintentional injuries among Nunavik youth

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### ABSTRACT

This study described the distribution of unintentional injuries among Inuit youth in Nunavik, Quebec, Canada, and examined the relationship between socio-demographic factors, substance use and unintentional injuries.

A cross-sectional study design was used on data collected for the Nunavik Child Development Study (2013–2015) among eligible youth aged 16 to 21 years old. Unintentional injury occurrence and causes (last 12 months) were assessed through individual interviews. A multivariate logistic regression model tested the relationship between socio-demographic, substance use variables and unintentional injury occurrence.

Among the 199 youth who participated (94% response rate), thirty youth reported being unintentionally injured in the past 12 months, of which 50% were female. All-terrain vehicle collisions were the most frequent injuries reported (23%). The odds of being injured decreased by 62% for youth who were currently employed compared to those who were unemployed, adjusting for other socio-demographic variables ( $p$ -value = 0.04). Heavy alcohol drinking in the past 12 months was not significantly associated with unintentional injury.

This study highlights the burden of unintentional injuries among Nunavik youth and the need for future work to explore additional and diverse variables that may prevent or contribute to injuries in order to inform culturally and developmentally-appropriate injury prevention strategies.

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## Introduction

Injuries are an important public health issue in Canada, with 16,000 persons dying every year as a result of preventable injuries[1]. Unintentional injuries, defined as any injury that is not caused on purpose or with the intention to harm[2], pose a particular threat to adolescents and are the leading cause of death among 10–19 years old in Canada[3]. Adolescence is a critical developmental period during which youth are exposed to increasing responsibilities and emerging independence, which present opportunities for risk taking behaviours[4]. Young men tend to experience significantly more unintentional injuries than women[5], which is likely driven by social construct of masculinity, including projection of strength, control and freedom that result in increased risk-taking[5]. Alcohol and drug experimentation and use, which is common at this age [6,7], also significantly increases injury risk[8]. Youth must learn to distinguish between safe and unsafe

behaviours, and understand the consequences of unsafe behaviours, in order to reach adulthood uninjured [9,10].

Unintentional injuries, including road traffic crashes, poisoning, drowning, burns, and falls are influenced by youth's education, employment status, socio-economic status and geographic environments [5,9]. Inuit youth in Canada face a disproportionately high burden of unintentional injuries, with unintentional injury mortality rates being more than five times the rates of Canadian youth overall [11,12]. The reasons for these discrepancies are numerous and complex, but can be explained in part by Canada's legacy of acculturation of Inuit peoples, through residential schools and settlement into permanent remote villages, which result in inequitable conditions of life [13,14]. Inuit families tend to experience more food insecurity, to have a lower level of educational attainment and to live in unsafe, substandard housing compared to other Canadians [15,16].

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Nunavik, one of the four regions of Inuit Nunangat located on the shores of the Hudson and Ungava Bay in the north of the province of Quebec [17], face the highest unintentional injury mortality rates of all four regions of Inuit Nunangat with 145.9 deaths per 100,000 population [12]. While different geographic and political contexts may influence the rates of unintentional injuries in this population, [18,19] little is known about the distribution of unintentional injuries among Nunavik youth more specifically. Up-to-date evidence providing a better understanding of the determinants of injuries among youth is urgently needed. This study aimed to describe the distribution of unintentional injuries among Inuit youth in Nunavik, and to examine the relationship between social and demographic factors and unintentional injuries among Nunavik youth. The findings of this study may guide community leaders and governments in the development of age-appropriate injury prevention initiatives promoting safety among Nunavik youth.

## Methods

### *Study design and analytic sample*

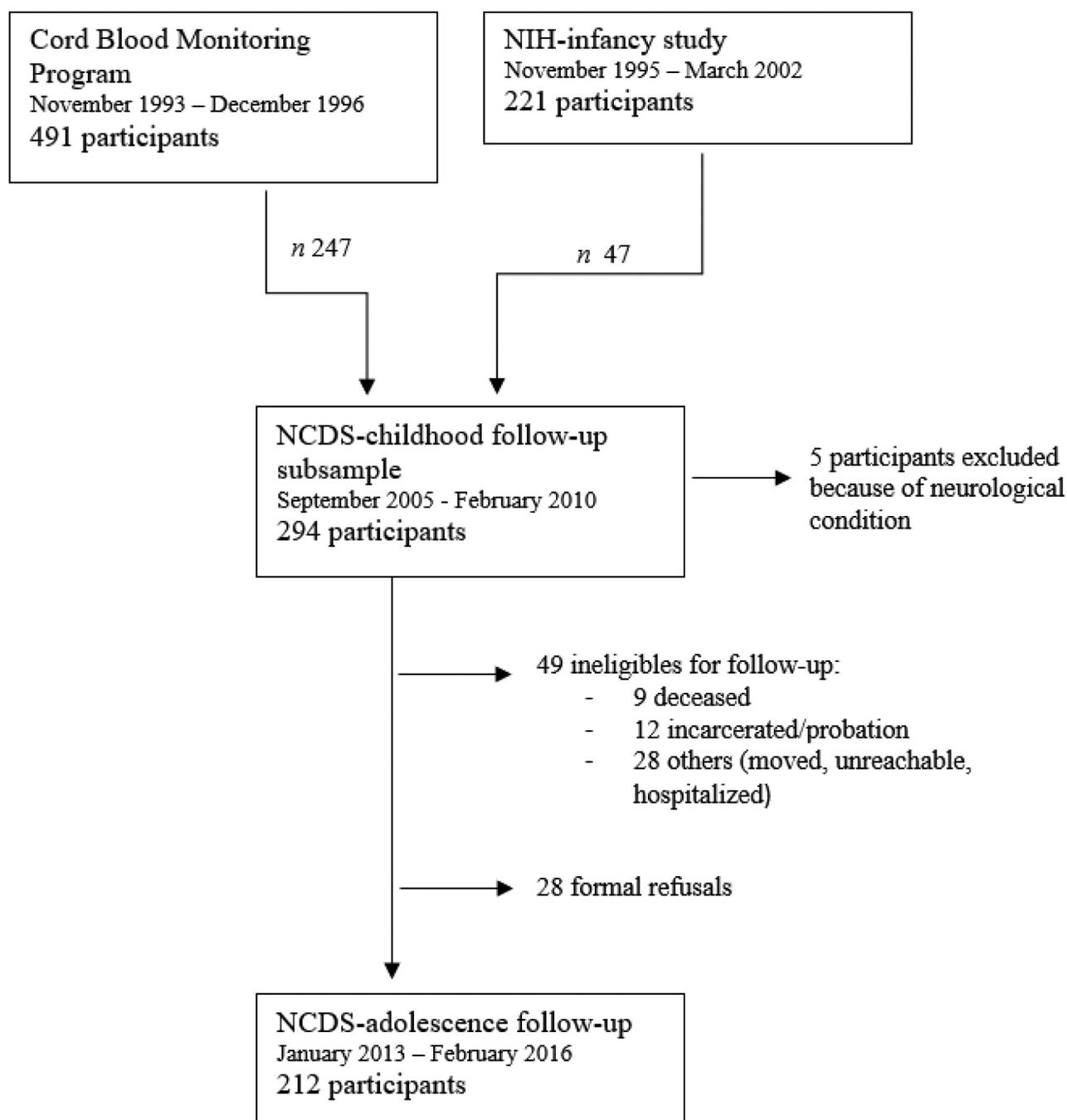
This cross-sectional study design takes advantage of data collected during the fourth phase of the Nunavik Child Development Study (NCDS). NCDS is a prospective longitudinal mother-child cohort study initiated in 1995 in Nunavik which followed children at age 1, 5, 9–13 and 16–21 years old with the primary aim to examine the effects of pre- and postnatal exposure to environmental contaminants on child growth, development and behaviour. Children from NCDS were recruited from two ongoing research projects in Nunavik between November 1993 and March 2002 (Cord Blood Monitoring Program and US National Institutes of Health infancy study) in which their mother was enrolled (Figure 1) [20,21]. Between January 2013 and February 2016, youth now aged 16 to 21 years old who participated in both the prenatal and childhood study and currently residing in Nunavik were eligible to participate in the fourth phase of the study. Forty-nine participants were excluded because they were either deceased, incarcerated or unreachable and 28 participants refused to participate, resulting in 212 youth included in the NCDS-Adolescence study (Figure 1) [21]. Girls were more likely than boys to be followed through adolescence (56% of girls vs 44% of boys,  $p = 0.02$ ), but there were no other differences (maternal age, parity, birth weight or cord blood concentration (Hg, Pb, DHA) between youth included in the NCDS-Adolescence

study and those no longer enrolled. More details about participant eligibility, the sampling strategy and differences between youth included in the NCDS-Adolescence study and those no longer enrolled have been published previously [20–22].

Half-day individual interviews took place in the three largest Nunavik villages (Kuujuaq, Puvirnituk or Inukjuak) and were conducted mainly in English by a research professional and a research nurse from the Research Center of the Centre Hospitalier Universitaire of Quebec (CHUQ) and an Inuit research team member who acted as an interpreter as needed. Eligible youth residing outside of these three Nunavik villages who consented to participate were flown by plane to the closest village administering interviews (travel costs covered). Written informed consent forms were obtained for each participant (signed by the youth if aged 18 years and older or by parents/guardians with an oral assent from the youth if younger than 18 years old) prior to the interview. A 50 USD-value music card was given to youth for participation. This study was approved by the Research Ethics Review Board of the CHUQ, and obtained the approbation of the Nunavik communities, the Nunavik Regional Board of Health and Social Services and the Kativik Regional Government.

### *Study variables*

Unintentional injury occurrence was assessed by the following question during the interview with the research nurse: “In the past 12 months, have you been injured seriously enough to require medical attention by a doctor, nurse or dentist?” Participants who answered positively were asked about the cause of injury, out of a list of 18 causes of injury (Figure 2). Intentional injuries, including domestic violence, suicide attempt and physical assault, were excluded for the purpose of this study. The following variables were extracted from interview questionnaires: sex (male/female), age (years), youth’s village location (Hudson coast/Ungava coast), education status (secondary school not completed and not currently attending school/secondary school completed and currently attending school/secondary school completed or higher), employment status (employed/unemployed), socio-economic status (Hollingshead Index; score 8–66), alcohol and drug consumption in the last 12 months (yes/no) and heavy alcohol drinking (yes/no). Socio-economic status (SES) was assessed using the Hollingshead Index, which uses caregivers’ education, occupation, sex and marital status to determine a family’s SES composite [23]. The Hollingshead Index



**Figure 1.** Flow chart for recruitment and follow-up of study participants from November 1993 to February 2016 including reasons and number of excluded participants through follow-ups. Note: NIH, National Institutes of Health; NCDS, Nunavik Child Development Study.

ranges from 8 to 66 with higher scores reflecting higher SES[23]. Heavy alcohol drinking was defined as consuming 5 drinks or more on the same occasion at least once a month for the past year[24]. Alcohol and drug consumption in the last 12 months was defined as having consumed alcohol and drug, respectively, at least once during this period.

### **Statistical analyses**

Descriptive statistics were calculated as mean and standard deviation for all continuous variables, and as counts and percentages for all categorical variables. A multivariate logistic regression model was applied to test the relationship between socio-demographic,

- Motor vehicle collision
  - ATV/Honda collision
  - Snowmobile collision
  - Scooter or motorcycle-related injury
  - Bike-related injury
- } Transport-related injuries
- Contact with hot liquid, object, etc.
  - Contact with a machine, tool, etc.
  - Accidental contact with another person or animal
  - Smoke, fire, flames
  - Extreme weather or natural disaster (i.e. flood)
  - Thin ice
  - Boating-related injury
  - Hunting-related injury
  - Overexertion or strenuous movement
  - Domestic/family violence
  - Other physical assault
  - Suicide attempt/other self-inflicted injury
  - Other
- } Intentional injuries (excluded)

**Figure 2.** List of unintentional injury causes, Nunavik Child Development Study, Youth population, Nunavik, 2013–2015.

substance use variables and unintentional injury occurrence in the last 12 months (yes-no), which was set as the binary outcome variable. The model was adjusted for socio-demographic variables. All tests were two-tailed, and statistical significance was set at a *p*-value of 0.05. Data analyses were performed using SPSS 20.0th edition.

## Results

Of the 212 eligible Inuit youth enrolled in NCDS, 199 agreed to answer questions on injury, providing a response rate of 94%. Socio-demographic and substance use characteristics of participants are presented in Table 1. A majority of participants were female (56%), employed (55%), and had not completed secondary school and were not currently attending school (51%) at the time of the interview. Thirty (15%) youth reported being unintentionally injured in the 12 months prior to the interview, of which 50% were female. Among both the injured and uninjured youth groups, a majority reported having consumed drugs (86% and 65% respectively) and alcohol (93% and 82% respectively) at least once in the 12 months prior to the interview. Among youth who reported being injured, 35% reported heavy drinking habits, as opposed to 60% in the uninjured group (Table 1).

All-terrain vehicle (ATV)/Honda collisions were the most frequent injuries reported (23%). Transport-related injuries, including motor vehicle, ATV/Honda and snowmobile collisions, scooter or motorcycle-

related injury, and bike-related injury, accounted for 57% of all unintentional injuries reported. The remaining injuries were distributed among other causes, for which frequencies were too small to be further presented.

Results of the multivariable logistic model are presented in Table 2. The odds of being injured were not significantly different for males and females (OR:1.38 95% CI:0.62–4.03, *p*-value = 0.51). The odds of being injured decreased by 62% for youth who were currently employed compared to those who were unemployed, adjusting for other socio-demographic variables (OR: 0.38 95% CI: 0.18–0.96, *p*-value = 0.04). Other socio-demographic variables, and heavy drinking habits were not significantly associated with unintentional injury.

## Discussion

This study described the socio-demographic and substance use characteristics of Nunavik youth who reported an unintentional injury in the 12 months prior to the study and showed that employed youth had lower odds of being injured compared to unemployed youth. Other variables, including sex and heavy alcohol drinking in the past 12 months, were not significantly associated with injury occurrence. This study highlights the importance of deepening our understanding of unintentional injuries among Nunavik youth, as they face different developmental, social, emotional, and physical realities than the overall

**Table 1.** Socio-demographic and substance use characteristics of youth participants, N (%) and mean (Standard deviation-SD), Nunavik Child Development Study, Nunavik, 2013–2015.

Characteristics	Injured N = 30	Not injured N = 169	Total N = 199
<b>Sex</b>			
Male	15 (50.0%)	73 (43.2%)	88 (44.2)
Female	15 (50.0%)	96 (56.8%)	111 (55.8)
<b>Age<sup>a</sup></b>	18 (SD 0.9)	18 (SD 1.1)	18 (SD 1.1)
<b>Youth's village location</b>			
Hudson coast	12 (40.0%)	63 (37.3%)	75 (37.7)
Ungava coast	18 (60.0%)	106 (62.7%)	124 (62.3)
<b>Education status</b>			
Secondary school not completed & not currently attending school	20 (66.7%)	82 (48.5%)	102 (51.3)
Secondary school not completed & currently attending school	7 (23.3%)	61 (36.1%)	68 (34.1)
Secondary school completed or higher	Np	26 (15.4%)	29 (14.6)
<b>Employment status</b>			
Employed	13 (43.3%)	97 (57.4%)	110 (55.3)
Unemployed	17 (56.7%)	72 (42.6%)	89 (44.7)
<b>SES Hollingshead Index score<sup>b</sup></b>	21 (SD 9.8)	22 (SD 8.8)	22 (SD 8.9)
<b>Drug consumption past 12 months</b>			
Yes	25 (86.2%)	110 (65.0%)	135 (67.9)
No	Np	53 (31.4%)	57 (28.6)
Missing	1	6 (3.6%)	7 (3.5)
<b>Alcohol consumption past 12 months</b>			
Yes	27 (93.1%)	139 (82.2%)	166 (83.4)
No	Np	24 (14.2%)	26 (13.1)
Missing	1	6 (3.6%)	7 (3.5)
<b>Heavy Drinking<sup>c</sup></b>			
Yes	10 (35.7%)	102 (60.4%)	112 (56.3)
No	18 (64.3%)	61 (36.0%)	79 (39.7)
Missing	2	6 (3.6)	8 (4.0)

a.Youth between age 16 and 21 years old were eligible to participate

b.SES Hollingshead Index score uses caregivers' education, occupation, sex and marital status to determine a family's SES composite ranging from 8 to 66 with higher scores reflecting higher SES.

c.Heavy alcohol drinking defined as consuming 5 drinks or more on the same occasion at least once a month for the past year.

d.Np; Data not presented due to small number of respondents

Nunavik population, which likely influence their risk of injury and the solutions to promote their safety.

Injury occurrence reported among Nunavik youth (15%) is similar to what was previously described in other youth populations, although differences in youth age definition limit detailed comparisons. In 2016, 17.2% of Quebec population aged 15–24 years reported having had an injury that limited their usual activities over the previous year [25], while 17% of Canadians aged 11–15 years reported being severely injured in 2009–2010 [26]. Unintentional injury-related deaths, as well as emotional, social and economic consequences of injuries were not included in this study but must be considered to provide a comprehensive understanding of the burden of injury faced by Nunavik youth. Given Nunavik geographic context, youth who sustain a severe injury are likely to be flown outside the community to receive the best care and may require prolonged rehabilitation away from family and friends. These different consequences of unintentional injuries are important to measure to assist community leaders in determining priorities for actions, develop appropriate strategies and services, and evaluate the impact of such activities. Injury prevention indicators for Inuit

**Table 2.** Multivariable logistic regression model results for the relationship between socio-demographic, substance use characteristics, and unintentional injury occurrence among youth participants, Nunavik Child Development Study, Nunavik, 2013–2015.

Variables	Odds ratio (95%CI)	p-value
Sex (male)	1.38 (0.62–4.03)	0.51
Age (years)	1.15 (1.34–1.85)	0.65
Youth's village location (Ungava coast)	1.37 (0.58–3.38)	0.48
Currently employed (yes)	0.38 (0.18–0.96)	0.04*
SES Hollingshead Index (score) <sup>a</sup>	1.03 (0.92–1.13)	0.65
Heavy Drinking (yes) <sup>b</sup>	1.41 (0.56–4.50)	0.69

\*p-value<0.05

a.SES Hollingshead Index score uses caregivers' education, occupation, sex and marital status to determine a family's SES composite ranging from 8 to 66 with higher scores reflecting higher SES.

b.Heavy alcohol drinking defined as consuming 5 drinks or more on the same occasion at least once a month for the past year.

children and youth have been identified through an extensive process by the First Nations and Inuit Children and Youth Injury Indicators Project Task Group, with the aim to provide a framework for collecting data[27]. *Qanuippitaa? National Inuit Health Survey* is intended to be conducted in Inuit Nunangat (every five years) starting between 2021–2023 and will provide information on a wide variety of topics for Inuit of all

ages, including youth, on a regularly scheduled basis [28]. This may be a great opportunity to identify youth safety as a priority and ensure relevant and strength-based injury indicators to develop sustainable and Inuit-led data collection tools. Injury surveillance is highly needed to inform evidence-based strategies that will successfully ensure safety among Inuit youth.

Transport-related injuries, and most specifically ATV/Honda collisions, were the main cause of injury among Nunavik youth in this study. Motor vehicle crashes including ATV and snowmobile collisions have been previously described as an important cause of injury in Nunavik [29] and in Northern communities [30,31], which is likely influenced by the fact that ATVs and snowmobiles are often the main method of transportation to get out on the land and around communities. Between 2011 and 2015, the Nunavik prevention and awareness campaign on off-highway vehicles “On the Right Path” promoted safe operation of snowmobiles and ATV among Nunavik youth through innovative educational and mobilisation activities on social media [32]. The results of this study emphasise the need for additional prevention campaign efforts to address this issue among Nunavik youth. It also highlights the importance of looking specifically at the Nunavik youth population to inform successful injury prevention strategies, because when looking at both youth, adults and seniors in Nunavik, recent reports concluded that falls was the leading cause of injury [29,33].

The absence of difference in the odds of injury occurrence between Nunavik youth males and females is surprising given the literature consistency in reporting an increased risk of unintentional injury among males of all age groups and populations, likely resulting from more risky behaviours and activities [11,25,33–35]. The small number of youth who reported an injury may have contributed to the lack of statistical difference observed according to sex, but additional research is needed to confirm those findings. Although youth who are working may experience occupational injuries, being employed or not has seldom been studied as a determinant of injury [36], and has shown no association with injury occurrence when examined previously [33]. In the context of this present study, being employed as a youth may be a proxy measure to other variables, including leisure time and hours spent on the land, which may be important to consider in further research. Injury data included in medical databases provide little information on sociocultural and lifestyle variables, emphasising the need for additional research that could explore other determinants, including climate changes, cultural connectedness, mental

health and wellbeing and other associated risky behaviours in relation to unintentional injuries. Adolescence is a crucial period for the development of autonomy and self-regulatory skills, and youth’s need for peer acceptance and social support, evolving self-esteem and confidence, as well as lack of experience with weather conditions when going out on the land may all influence injury risk. These social, cultural, and geographic determinants may offer upstream strategies to get at the root causes of unintentional injuries and ensure safety among Nunavik youth.

While driving under the influence of alcohol is a well-known risk factor for unintentional injuries [37,38] including off-road vehicle injuries in Nunavik [30], reporting heavy alcohol drinking in the past 12 months may not be a good proxy measure to reflect risk taking behaviours, including impaired driving, which may explain the absence of association between heavy alcohol drinking in the past 12 months and injury occurrence observed in this study. Research projects documenting alcohol and drug consumption at the time of injury through different methods including self-report and blood alcohol and drug concentration may be helpful to provide up-to-date evidence on substance use and injury risk to inform successful prevention strategies promoting safety among Nunavik youth.

Limitations of this study must be considered. Youth included in this study were not representative of the overall Nunavik youth population, but accounted for approximately 15% of this population [39]. Youth who suffered from injuries that resulted in cognitive impairment during childhood were excluded from this sample. The overall low frequency of youth who reported an injury in the past 12 months may have contributed to the lack of association between injury, sociodemographic determinants and substance use variables. Also, some variables were excluded from the logistic regression (education, alcohol and drug consumption in the past 12 months) given small numbers reported in some groups. Finally, given unintentional injury occurrence was assessed through self-reporting, a recall bias is possible, for which males may have underreported minor injuries compared to females, driven by social construct of masculinity [5], decreasing the strength of the association between sex and unintentional injury.

In conclusion, this study highlights the burden of unintentional injuries among Nunavik youth and the need for future work to explore additional and diverse variables that may prevent or contribute to injuries in order to inform culturally and developmentally-appropriate injury prevention strategies.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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## Appendix

### Injury-related questions, Nunavik Child Development Study, Nunavik, 2013-2015

**GH6. In the past 12 months, have you been injured seriously enough to require medical attention by a doctor, nurse or dentist?**

- Yes  
 No **GO TO GH9**

**GH7. If yes, what type of injury(ies) did you have?**

(CHECK ALL THAT APPLY)

- Broken or fractured bones  Poisoning  
 Burns or scalds  Injury to internal organ  
 Dislocation  Dental injury  
 Major sprain or strain  Repetitive strain  
 Minor cuts, scrapes or bruises  Hypothermia, frost bite  
 Concussion  
 Other: \_\_\_\_\_

**GH8. What caused the injury(ies)?**

- Motor vehicle collision  Domestic/family violence  
 ATV or Honda collision  Contact with a machine, tool, etc.  
 Snowmobile collision  Smoke, fire, flames  
 Scooter or motorcycle accident  Contact with HOT liquid, object, etc.  
 Extreme weather or natural disaster (i.e. flood)  
 Riding a bike  Thin ice  
 Hunting accident  Overexertion or strenuous movement  
 Boating accident  Suicide attempt or other self-inflicted injury  
 Accidental contact with another  Other physical assault person or animal  Other (Specify: \_\_\_\_\_)  
 Fall